Curriculum Vitae

Darren C. Ong
Professor of Mathematics,
Office 460, A4 Building,
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43900 Sepang, Selangor,
Malaysia.

Date of Birth   : 9 February 1987

Email Address   : darrenong@xmu.edu.my

Website   : https://www.drong.my

Citizenship   : Malaysia

Language proficiency : English (fluent), Malay (fluent)

Previous Work History

Associate Professor of Mathematics, Xiamen University Malaysia, Selangor, Malaysia
(6/2016-1/2022)
Postdoctoral Faculty, University of Oklahoma Department of Mathematics, Norman, USA.
(8/2014-5/2016)

Education History

Ph.D. Mathematics, Rice University (2014)
Thesis Title   : Spectral characteristics of aperiodic CMV and Schrödinger operators
Thesis Advisor   : David Damanik

M.A. Mathematics, Rice University (2012)

B.Sc. Mathematics, Texas Christian University (2009) *Summa cum Laude*
Thesis Title   : On a theorem of intersecting conics
Thesis Advisor   : Scott Nollet

Professional Membership

Editorial board member of the Bulletin of the Malaysian Mathematical Sciences Society.
Affiliate Member of the American Mathematical Society.

Research Interests

Research areas: Orthogonal polynomials; spectral theory of Schrödinger operators; quantum
dynamics; mathematical physics.

AMS Mathematics Subject Classification: 46, 47, 81.

Research Experience

<u>Accepted Publications:</u>

"Exact Mobility Edges for Almost-Periodic CMV Matrices via Gauge Symmetries" (with C. Cedzich, J. Fillman, L. Li, and Q. Zhou). To appear in *International Mathematics Research Notices.*

"Almost everything about the Unitary Almost Mathieu Operator" (with C. Cedzich and J. Fillman). *Communications in Mathematical Physics* **403**, 745–794 (2023). ISSN: 0010-3616

"Abstract art generated by Thue-Morse autocorrelation functions". *Bulletin of the Malaysian Mathematical Sciences Society* **384**, 46, Issue 153 (2023) ISSN: 0126-6705

"Simon's OPUC Hausdorff dimension conjecture" (with S. Guo and D. Damanik). *Mathematische Annalen* **384**, 1-37 (2022) ISSN: 0025-5831

"Subordinacy theory for extended CMV matrices" (with S. Guo and D. Damanik). *Science China Mathematics* **65**, 539–558 (2022) ISSN: 1674-7283

On Simon's Hausdorff Dimension Conjecture (with D. Damanik, J. Fillman and S. Guo). In: Gesztesy F., Martinez-Finkelshtein A. (eds) From Operator Theory to Orthogonal Polynomials, Combinatorics, and Number Theory. Operator Theory: Advances and Applications, **285** (2021) ISBN: 978-3-030-75424-2

"Restrictions on the existence of a canonical system flow hierarchy" (with I. Hur*). Integral Equations and Operator Theory* **93,** Number 40 (2021). ISSN: 0378-620X

"Quasiperiodic music". *The Journal of Mathematics and the Arts* **14**, Issue 4, 285-296 (2020) ISSN: 1751-3472

"Sharp spectral transition for eigenvalues embedded into the spectral bands of perturbed periodic operators" (with W. Liu). *Journal d'Analyse Mathematique* **141**, 625–661 (2020) ISSN: 0021-7670

"Generalized Toda flows" (with C. Remling). *Transactions of the American Mathematical Society* **371**, Issue 7, 5069–5081(2019)**.** ISSN: 0002-9947

"Spectral Approximation for Ergodic CMV Operators with an Application to Quantum Walks" (with J. Fillman and T. Vandenboom). *Journal of Mathematical Analysis and Applications* **467,** 132-147 (2018). ISSN: 0022-247X

"On a description of the Toda hierarchy using cocycle maps". *Linear Algebra and its Applications.* **549**, 12-29 (2018). ISSN 0024-3795

"A condition for purely absolutely continuous spectrum for CMV operators using the density of states" (with J. Fillman). *Proceedings of the American Mathematical Society*, **146**, Issue 2, 571-580 (2018). ISSN: 0002-9939
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"Purely Singular continuous spectrum for limit-periodic CMV operators with applications to quantum walks" (with J. Fillman). *Journal of Functional Analysis* . **272.12** 5107–5143 (2017). ISSN: 0022-1236

"Spectral Characteristics of the Unitary Critical Almost-Mathieu Operator" (with J. Fillman and Z. Zhang). *Communications in Mathematical Physics.* **351.2**, 525-561 (2017). ISSN: 0010-3616

"Generalized Prüfer variables for perturbations of Jacobi and CMV matrices" (with M. Lukic). *Journal of Mathematical Analysis and Applications* **444,** 1490-1514 (2016). ISSN: 0022-247X

"Spreading estimates for quantum walks on the integer lattice via power-law bounds on transfer matrices" (with D. Damanik and J. Fillman). *Journal de Mathématiques Pures et Appliquées* **105.3,** 293-341 (2016). ISSN: 0021-7824

"Wigner-von Neumann type perturbations of periodic Schrödinger operators" (with M.Lukic). *Transactions of the American Mathematical Society* **367,** 707-724 (2015). ISSN: 0002-9947

"Hölder continuity of spectral measures of an extended CMV matrix" (with P. Munger). *Journal of Mathematical Physics* **55,** 093507 (2014). ISSN: 0022-2488

"Purely singular continuous spectrum for CMV operators generated by subshifts". *Journal of Statistical Physics* **155**, 763-776 (2014). ISSN: 0022-4715

"Orthogonal polynomials on the unit circle with quasiperiodic Verblunsky coefficients have generic purely singular continuous spectrum". Discrete and Continuous Dynamical Systems. Proceedings of the 9th AIMS Conference Special Issue, pp. 605–609 (2013).

"Limit-periodic Verblunsky coefficients for orthogonal polynomials on the unit circle". *Journal of Mathematical Analysis and Applications* **394.2,** 633-644 (2012). ISSN: 0022-247X

"On a theorem of intersecting conics". *Forum Geometricorum* **11,** 95-107 (2011).

"The Frobenius number of geometric sequences" (with V. Ponomarenko). *INTEGERS: The Electronic Journal of Combinatorial Number Theory* **8**, A33 (2008). ISSN: 1553-1732

Grants

NSF China Young Scholars Fund, "准周期 CMV(Cantero-Moral-Velazquez)算子与量子游走的应用". 1 Jan 2023- 31 Dec 2025. Grant amount: 300,000 Chinese Yuan (Principal Investigator)

XMUM Research Fund, "Aperiodic order in science and arts". 1 Jan 2023- 31 Dec 2025. Grant amount: RM 50,000 (Principal Investigator)

Fundamental Research Grant Scheme (Malaysian Ministry of Education), "Aperiodic quantum walk models exhibiting exotic spectral behaviour connected to quantum computing algorithms" computing algorithms". 1 Jan 2023- 31 Dec 2025. Grant amount: RM117500 (Principal Investigator).

Fundamental Research Grant Scheme (Malaysian Ministry of Education), "Spreading rates of

quantum random walks in an almost periodic environment, with potential applications in quantum computing". Oct 2018-Sep 2021. Grant amount: RM75,000 (Principal Investigator)

XMUM Research Fund, "Canonical Systems and Aperiodic Order". 1 Jan 2020- 31 Dec 2021. Grant amount: RM 20,000 (Principal Investigator)

XMUM Research Fund, "Spectral analysis of almost periodic and perturbed periodic operators, with applications to quantum walks". 1 Feb 2018- 31 Jan 2020. Grant amount: RM 20,000 (Principal Investigator)

Fundamental Research Grant Scheme (Malaysian Ministry of Education), "Understanding aperiodically ordered patterns in crystalline structures". Nov 2020-April 2023. Grant amount: RM76,200 (Member)

Non-academic publications:

"The Trampolines that Nadia built" (Illustrated by Anngee Neo), Epigram Books, Singapore (2018). ISBN: 9789810732585

Invited Talks

PERFIK 2023 Malaysian National Physics Conference (Online, 2023) "Quantum Walk models corresponding to exotic spectra"

2023 XMU/XMUM Joint Mathematics Workshop (2023). Xiamen University, Xiamen, China. "CMV matrix symmetries and their connection to quantum walks"

Annual General Meeting of Malaysian Mathematical Sciences Society (2022). Universiti Kebangsaan Malaysia, Bangi, Malaysia. "Aperiodic Order in Visual Arts and Music"

Departmental Seminar, INSPEM, University Putra Malaysia, Serdang, Malaysia (2022). "Aperiodic Order in Visual Arts and Music".

Spectral Theory Seminar, Rice University, USA (2022). "Aubry Duality for Unitary Operators with Applications to Quantum Walks"

Departmental Seminar, Pusat Pengajian Sains Matematik, University Sains Malaysia, Penang, Malaysia (2021). "Aperiodic Order in Visual Arts and Music".

16th IMT-GT International Conference of Mathematics, Statistics, and their Applications (2020). "Quasiperiodic music". W*inner of Best Virtual Presentation Award*

Departmental Seminar, University of Bielefeld, Bielefeld, Germany (2019). "Aperiodic Random Walks".

11th St Petersburg Conference in Spectral Theory, St Petersburg, Russia (2019), "Sharp spectral transition for eigenvalues embedded into the spectral bands of perturbed periodic operators".

Curriculum Vitae

Joint Meeting of the Korean Mathematical Society and Deutsche Mathematiker-Vereinigung, Seoul, South Korea (2018), "The Unitary Almost-Mathieu Operator".

Departmental Seminar, Pusat Pengajian Sains Matematik, University Sains Malaysia, Penang, Malaysia (2018). "Aperiodic Order".

AMS Special Session on Spectral Theory, Western Spring Sectional Meeting, Portland, USA (2018), "Purely singular continuous spectrum for limit-periodic CMV operators with applications to quantum walks".

36th Annual Western States Mathematical Physics Meeting, University of California- Irvine, USA (2018). "Generalized Toda flows".

Geometry-Analysis seminar, Rice University, USA (2018). "Generalized Toda flows".

Oberwolfach Workshop on Spectral Structures and Topological Methods in Mathematical Quasicrystals, Mathematisches Forschungsinstitut Oberwolfach, Germany (2017), "Quasicrystalline structures and quantum walks".

Mathematical Physics Seminar, University of California-Irvine Mathematics Department, Irvine, USA (2017), "A generalization of the KdV hierarchy to canonical systems.**".**

Special Seminar, University of Oklahoma Mathematics Department, Norman, USA (2017), "A generalization of the KdV hierarchy to canonical systems.**".**

INSPEM Mathematical Physics Seminar, University Putra Malaysia, Serdang, Malaysia (2016), "Some results on the spreading of a quantum walk, using ideas from spectral theory and orthogonal polynomials".

Program Bual Bicara Akademik, Kolej Matrikulasi Selangor, Banting, Malaysia (2016), "Asal kemahiran matematik: bakat atau latihan?"

Frank Stones Memorial Colloquium, Texas Christian University, Fort Worth, USA (2016), "Some results on the spreading of a quantum walk, using ideas from spectral theory and orthogonal polynomials".

AMS Special Session on Spectral Theory of Ergodic Schrödinger Operators and Related Models, Western Fall Sectional Meeting, Fullerton, USA (2015), "A characterization of generalized Toda flows using cocycle dynamics".

AMS Special Session on Spectral Theory, Disorder, and Quantum Many Body Physics, Central Spring Sectional Meeting, East Lansing, USA (2015), "Decaying oscillatory perturbations of periodic Schrödinger Operators".

Mathematical Physics Seminar, University of California-Irvine Mathematics Department, Irvine, USA (2015), "Decaying oscillatory perturbations of periodic Schrödinger Operators**".**

AMS Special Session on Spectral Theory, Western Spring Sectional Meeting, Albuquerque,

USA (2014), "Uniform absence of point spectrum for the period doubling CMV operator".

AMS Special Session on Quantum Walks, Quantum Computation and Related Topics, 2014 Joint Mathematics Meeting, Baltimore, USA (2014), "Results on the Hölder continuity of spectral measures of an extended CMV matrix".

Mathematical Physics Seminar, University of California-Irvine Mathematics Department, Irvine, USA (2013), "New results concerning the extended CMV operator**".**

Invited Colloquium Speaker, Texas Christian University Mathematics Department, Fort Worth, USA (2012), "Limit-periodicity of the recurrence coefficients of orthogonal polynomials corresponding to measures on the unit circle".

The 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, USA (2012) , "Orthogonal polynomials on the unit circle with almost periodic recursion coefficients".

Spectral Theory and Dynamics of Cocycles Minisymposium, Equadiff in Loughborough, United Kingdom (2011), "Limit-periodic Verblunsky coefficients in OPUC".

Awards and Honors

- Best Presenter, 5th International Conference on the Mathematical Sciences. Bangi, Malaysia
- Third Prize, Art Category, 2020 CARMA Maths Art/Poster Competition, University of Newcastle, Australia
- Best Virtual Presentation Award, 16th IMT-GT International Conference of Mathematics, Statistics, and their Applications 2020.
- 2009 Phi Beta Kappa Senior Scholar, Texas Christian University.
- 2009 Mathematics Senior Scholar, Texas Christian University .
- Inductee, Pi Mu Epsilon (Mathematics honor society) 2008.
- Chancellor's Scholarship, Texas Christian University, 2005-2009.
- Bronze Medalist, International Mathematical Olympiad 2004 in Athens, Greece.
- Honorable Mention, International Mathematical Olympiad 2002 in Glasgow, UK.
- Participant, International Mathematical Olympiad 2003 in Tokyo, Japan.